

		ASN	2012-WSA-105-COA
		Case Status	VALIDATED
		Date Createc	04/01/2011
		Date Submittec	08/22/2012
Proponent Organization		Sponsor	Oregon Army National Guard
		Attn Of	Todd E. Farmer
		Address	1776 Militia Way
		Address2	P.O. Box 14350
		City	Salem
		State	OR
		Postal Code	97309-5047
		Telephone	(503) 584-3472
		Email	todd.farmer@us.army.mi
Declaration		Declaration(a)	Yes
		Declaration(b)	Yes
Point of Contact		Representative	Gregg A. Schroeder
		Address	1776 Militia Way
		Address2	P.O. Box 14350
		City	Salem
		State	OR
		Postal Code	97309-5047
		Telephone	(503) 584-3472
		Email	gregg.schroeder@us.army.mi
Operational Description	Requested Effective Period	Beginning	
		End	
		Light out operator	No
		VFR operator	Yes
		IFR operator	No
		Day operator	Yes
		Night operator	No
		Program Executive Summary	Request a Certificate of Authorization (COA) to operate the RQ-7B Shadow Unmanned Aerial System (UAS) outside Restricted Airspace.
		Operational Summary	Detachment 1, B Company STB TUAS Platoon has 4 RQ-7B UAS assigned to the 41st Separate Infantry BCT. These UAS may be flown as frequently as 7 days per week and up to 52 Weeks per year. The establishment of this COA will allow the Army Unit to maintain proficiency, currency and annual evaluation flights. Operations will originate from Eastern Oregon Regional Airport, Pendleton Oregon, Daytime only. COA consists of two "zones". Zone A is within Class D. Two-way radio comms with the control tower shall be maintained and ground observers at intervals will maintain postive over watch. Zone B will be outside of Class D and will utilize a chase aircraft.
	Location	State	OR
		County	Umatilla
		Nearest Airport	EASTERN OREGON RGNL AT PENDLETON
		AOR	Oregon

	Class Of Airspace	Class-A	
		Class-B	
		Class-C	
		Class-D	Yes
		Class-E	Yes
		Class-G	Yes
System Description		Aircraft Type	8063 - Shadow - RQ-7B
		Aircraft Type And Model Description Attachment	1
		Control Station Attachment	1
		Communications System Attachment	1
		List Certified Components (TSO) Attachment	1
		Other Attachment	0
Performance Characteristics		Climb Rate (feet/Minute)	500
		Descent Rate (feet/Minute)	600
		Turn Rate (Degrees/Second)	6.0
	Cruise Speed	Maximum	118
		Minimum	60
		Approach Speed	60
	Operating Attributes	Maximum MSL	3000
		Minimum MSL	0
		Gross Takeoff Wt	375.0
		Launch/Recovery Attachment	2
Airworthiness		FAA Type Certificate	
		If No FAA Certificate (Public Aircraft Only) Attachment	1
Procedures		Lost Link/Mission Procedures Attachment	1
		Lost Communications Procedures Attachment	1
		Emergency Procedures Attachment	1

Avionics/Equipment		Equipment Suffix Type	U
		GPS	Yes
		Moving map indicator (Command Station)	Yes
		Tracking capability	Yes
		TCA/MCAS	Yes
		ELT	No
	Transponder	Transponder	Yes
		On	Yes
		Off	Yes
		Standby	Yes
		Ident	Yes
		Mode S	No
		Mode C	Yes
		Transponder Retuneable in Flight	Yes
Lights		Landing	No
		Position/Navigational	Yes
		Anti-collision	Yes
		Infrared (IR)	No
Spectrum Analysis Approval		Data Link	Yes
		Data Link Attachment	0
		Control Link(s)	Yes
		Control Link Attachment	0
		Operations utilizing Radio Control (R/C) frequencies as described in Title 47 CFR 95	Yes
		NTIA/FCC Authorization Attachment	6
ATC Communications	Transmitter VHF Band	VHF Band	Yes
		Quantity	1
		In-Flight Retunable	Yes
	Transmitter UHF Band	UHF Band	Yes
		Quantity	1
		In-Flight Retunable	Yes
	Transmitter HF band	HF Band	Yes
		Quantity	1
		In-Flight Retunable	Yes

	Receiver VHF Band	VHF Band	Yes
		Quantity	1
		In-Flight Retunable	Yes
	Receiver UHF Band	UHF Band	Yes
		Quantity	1
		In-Flight Retunable	Yes
	Receiver HF band	HF Band	Yes
		Quantity	1
		In-Flight Retunable	Yes
	Guard (Emergency) Frequencies VHF Band	VHF Band	No
		Quantity	
	Guard (Emergency) Frequencies UHF Band	UHF Band	No
		Quantity	
	Instantaneous Two-Way Voice	Direct to pilot	Yes
		SATCOM	No
		Relay via aircraf	No
Electronic Surveillance/ Detection Capability		EO/IR	Yes
		Terrain detectior	No
		Weather/icing detector	Yes
		Radar	No
		Other Attachment	0
		Electronic detection systems	No
		Electronic detection systems attachment	1
		Radar observator	No
		NAS Operational Capability Attachment	0
Visual Surveillance/ Detection Capability	Maximum Distance from UA	Vertical	3000 Feet
		Horizontal	0.87 Nautical Miles

		Airborne based (Chase Aircraft)	No
		Ground basec	Yes
		Visual observation from one or more ground sites	Yes
		Forward or side looking cameras	Yes
		Attachment for AI	1
Aircraft Performance Recording			
		Flight data recording	Yes
		Control station recording	Yes
		Voice Recording	No
Flight Aircrew Qualifications	Pilots		
		Private (Written)	No
		Private (Certified)	No
		Instrument	No
		Commercial	No
		Air Transport	No
		Unique Trained Pilo	No
		Unique Trained Pilot Description	
		DOD certified/trainec	Yes
		Other Certified Training	Yes
	Observers	Trained on FAR Part 91 Requirement	Yes
		Medical Certification Class (FAA or DOD equivalent)	2
		Currency Status	IAW Army Regulations
		Duty Time Restrictions	IAW Army Regulations
		Single UAS Contro	Yes
		UAS Description	
		Total Numbers of UAS Controlled	1
		Private (Written)	No
		Private (Certified)	No
		Instrument	No
		Commercial	No
		Air Transport	No
		Unique Trained Pilo	No
		Unique Trained Pilot Description	
		DOD certified/trainec	Yes
		Other Certified Training	Yes

		Trained on FAR Part 91 Requirement	Yes
		DOD Certified Training Attachment	0
		Medical Certification Class (FAA or DOD equivalent)	2
		Currency Status	IAW Army Regulations
		Duty Time Restrictions	IAW Army Regulations
		Single UAS Contro	Yes
		UAS Description	
		Total Numbers of UAS Controlled	1
Special Circumstances		Special Circumstances	

Flight Operations Area/Plan

Type	User Defin Point	Loc ID	Degree	Distance	Latitude	Longitude	MSL Ceilin
DEPARTURE					PDT-APT		0

Total Map Attachment 2

MSL Floor	Maximum	Minimum	Radius	SUA Description	
0		45-41-42.20N		118-50-29.20W	4000

1000

120

55

5.0

AIRCRAFT SYSTEM

RQ-7B SHADOW: Shadow Unmanned Aircraft System

The RQ-7 Shadow 200 unmanned aerial vehicle is of a high-wing, constant chord pusher configuration with a twin-tailboom empennage and an inverted v-tail elerudder. The aircraft is powered by a 38 bhp (28 kW) AR741-1101 Wankel engine manufactured by UAV Engines Ltd. Onboard electrical systems are powered by a GEC/Plessey 28 volt, direct current, 2,000 watt generator. Currently, the primary payload for the aircraft is the Israeli Aircraft Industries POP300 Plug-in Optical Payload which consists of a forward-looking Infrared camera, a daytime TV camera with a selectable near-infrared filter and a laser pointer. The aircraft has fixed tricycle landing gear. Takeoffs are assisted by a trailer-mounted pneumatic launcher which can accelerate the 375 pound aircraft to 70 knots (130 km/h) in 50 feet (15 m). Landings are guided by a Tactical Automatic Landing System developed by the Sierra Nevada Corporation which consists of a ground-based micro-millimeter wavelength radar and a transponder carried on the aircraft. Once on the ground, a tailhook mounted on the aircraft catches an arresting wire connected to two disk brake drums which can stop the aircraft in less than 170 feet (52 m).

The aircraft is part of a larger system which currently uses the M1152-series of Humvees for ground transport of all ground and air equipment. The system consists of four aircraft, three of which are transported in the Air Vehicle Transporter (AVT). The fourth is transported in a specially-designed storage container to be used as a spare. The AVT also tows the launcher. The AVT Support Vehicle and trailer contain extra equipment to launch and recover the aircraft, such as the Tactical Automatic Landing System. Maintenance equipment for the aircraft is stored in the Maintenance Section Multifunctional (MSM) vehicle and trailer as well as the M1165 MSM Support Vehicle and its associated trailer. The system also contains two HMMWV-mounted Ground Control Stations (GCS) which control the aircraft in flight. Each GCS has an associated Ground Data Terminal (GDT). The GDT takes commands generated by the GCS and modulates them into radio waves which are received by the aircraft in flight. The GDT also receives video imagery from the payload as well as telemetry from the aircraft and sends them to the GCS. Each GDT is stored for shipping on a trailer which also houses a 10 kW Tactical Quiet Generator which powers its associated GCS. Each trailer is towed by a M1165 GCS Support Vehicle. Each system also contains one Portable Ground Control Station (PGCS) and Portable Ground Data Terminal (PGDT). The PGCS and PGDT are stripped-down versions of the GCS and GDT and are designed to be used as a backup to the two GCSs.





OREGON MILITARY DEPARTMENT
JOINT FORCE HEADQUARTERS, OREGON NATIONAL GUARD
STATE ARMY AVIATION OFFICE
1776 MILITIA WAY
P.O. BOX 14350
SALEM, OREGON 97309-5047

SAAO

11 April 2012

MEMORANDUM FOR Department of the Army Representative NCO FAA, Western Service Area, 1601 Lind Avenue SW, Renton, WA 98057

SUBJECT: Certificate of Authorization Raven Unmanned Aerial Vehicle Operations; Reference COA Online #2334, for the Shadow (RQ-7B) Unmanned Aerial System at Eastern Oregon Regional Airport, Pendleton, Oregon.

1. Purpose. This request is to support the flight operations, training and sustainment program for Detachment 1 Bravo Company (MI) 41st Special Troops Battalion, 41st Infantry Brigade Combat Team. This COA request is submitted to your office in accordance with Army Regulation 95-2, Airspace, Airfields/Heliports, Flight Activities, Air Traffic Control and Navigational Aids dated 16 October 2008; FAA Order 7210.3U, Part 6, Chapter 18 dated 16 February 2006; and FAA Order JO 7610.4 – Special Military Flight Operations – ROA. This COA supports intermittent operations, 7 days a week at Pendleton, Oregon in Class D and Class E and airspace up to 4000 feet AGL.
 - a. Background. The Shadow (RQ-7B) is an Unmanned Aerial System, part of the Tactical Army family. It is launched by a Nitrogen Charged Launcher, lands on an improved or unimproved strip via a Tactical Automatic Landing System (TALS) with a maximum gross weight of 370 lbs.
 - b. Scope. The State Army Aviation Office manages all aviation assets within the Oregon Army National Guard and desires to sponsor the request for a Certificate of Authorization to conduct Shadow flight operations for the expressed purpose of operational training and sustainment for flight crews within the boundaries of the Pendleton (PDT) COA.
2. Effective Dates. 15 June 2012 - 14 June 2014
3. Description of Flight Operations Area. The Pendleton COA is segmented into two parts, Zone A (area within Class D airspace at Eastern Oregon Regional Airport, KPDT) and Zone B (portion North and West of KPDT Class D). The number of flights is estimated to be equal to or less than 15 per month with maximum flight duration of 4 hours. Maximum flight altitude and boundaries were considered carefully to avoid General Aviation, the general public and populated areas. All RQ-7B Shadow operations will commence, be flown and terminate within in PDT COA Area.
4. Classification of Airspace. Eastern Oregon Regional Airport is Class D airspace from the surface up to 4,000 feet MSL. Flights in the COA outside of Class D will be flown in Class E airspace from a minimum of 2,000 feet AGL to 4,000 feet AGL depicted on Seattle (VFR) Sectional as amended. Please refer to COA Online # 2334 and attached diagram for COA Boundaries. (See PDT COA v3r Map attached)
5. UAS physical characteristics. See AWR for Shadow (RQ-7B), COA Online # 2334

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SUBJECT: Application for Certificate of Authorization Shadow Tactical Unmanned Aerial Vehicle Operations; Reference COA Online # 2334

- a. Method of Pilotage. The RQ-7B is controlled by an automatic takeoff and landing system, it is rail catapult launched and uses a tail hook for rolling arrested recoveries, both within an area of 1150' length by 50' width. The Air Vehicle (AV) comes equipped with Standard aircraft red and green positions lights, a white anti-collision strobe light arrangement which all shall remain on and operational while flying in the COA. The AV is equipped with a remotely programmable Mode 3A/C and Mode 4 (IFF) transponder with a discrete squawk assignment for Chinook approach in accordance with letter of agreement. Emergency landings are by use of a parachute. Recovery and landing is typically performed autonomously by the Tactical Automated Landing System (TALS), a process similar to an Instrument Landing System (ILS) approach for manned aircraft. A UAS operator located in the Ground Control Station (GCS) controls the air vehicle, continually monitoring system status, and maneuvers the air vehicle as desired. The downlink data includes a display of health and status parameters such as attitude, magnetic heading, indicated airspeed, GPS position, barometric altitude, rate of climb, engine instrumentation, and warnings and cautions. Air vehicle position is displayed onto a high-resolution digital map within the GCS. The primary and backup links have an operational range of 109 nautical miles. Both links incorporate error detection to ensure that erroneous interference is not processed by the avionics. Two separate up-link frequency bands and one directional, and one omni-directional antenna are incorporated to minimize communication link issues due to interference.
- b. Lost Link (LOL)/mission abort procedures. In the event of lost link within Class D airspace, the UAS is programmed to fly via a predetermined route to a waypoint located at N 45 45' 12.72" W 118 52' 04.59. The waypoint is within 4 nautical miles from the Ground Control Station in a remote geographic location where the potential for reacquiring direct control of the UA is enhanced. If re-establishment of link is not accomplished, the UA will remain in loiter until a flight termination command is autonomously executed by the UAS pilot/operator and an emergency chute is deployed. If Lost Link occurs outside Class D and in Chinook Approach sector, the UAS shall fly a direct path to the UAV Holding area as established by Chinook Approach until link is either re-established or flight termination is executed as stated previously. (See attached Map - PDT UAV Ops II).
- c. Command and Control. Governed by regulation (AR 95-23), every flight has an assigned Air Mission Coordinator who maintains oversight for the entire operation. A Tactical Unmanned Aerial Platoon (Shadow) is equipped with two Ground Control Stations and one Portable Ground Control Stations. A typical flight will employ one of the Ground Control Stations as the primary control platform with an individual co-located with ability to transfer control authority back and forth. This provides redundancy for in-flight emergencies and/or lost link. The Mission Coordinator maintains positive Radio communication with Air Vehicle Operators, Ground Observers, Air Traffic Control Facility and Flight Operations.

Wing Span	15 Feet (Comms Relay Packet)
Weight	375 lbs
Range	125 Km
Airspeed	70 Knots Loiter – 110 Knots dash
Altitude	15000 ft MSL
Endurance	4 hours (at 50 kmph)
Primary Payload	EO / IR (up to 60 lbs)
Launch / Recovery	1150 X 50 feet

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SUBJECT: Application for Certificate of Authorization Shadow Tactical Unmanned Aerial Vehicle Operations; Reference COA Online # 2334

Climb Rate	1,500 (feet per minute)
Transponder	Mode 3 A/C

- d. Traffic Avoidance. Qualified Ground Observers will maintain continuous visual contact with the Unmanned Aircraft (UA) providing operators with instructions in order to maintain clear of other aircraft. Instructions given by PDT ATC shall be adhered to and no mixing of manned / unmanned aircraft shall be permitted per LOA and DoD Directive 02-12. Geography and / or manmade objects will dictate proximity requirements between the UA and observers but at no time shall the distance exceed one and one half (1 ½) nautical miles laterally and / or 3000 feet vertically. Flights occurring in the PDT COA area but outside Class D airspace shall be observed using a chase aircraft.
 - i. Two way radio communications must be established prior to UA operations and continue throughout mission profile.
 - ii. Weather requirements shall be under Visual Flight Rules with additional considerations given to sustained wind speed and gust to ensure safe operations. Minimum Ceilings shall be 5,000 feet and 5 mile visibility.
6. Coordination Procedures. For all flights, the Mission Commander shall notify PDT Base Operations a minimum of 24 hours in advance to coordinate and issue a Notice to Airmen (NOTAM). All UAS flights shall file a flight plan and shall receive a weather briefing.
7. Communication Procedures. Mission Commanders shall ensure reliable UHF or VHF communication is established between the UAS Operator, the Ground Observers / Chase Aircraft and PDT Tower prior to launch. Additionally, telephonic communications will be established as a back up in case of radio failure. The UAS Operator shall remain in contact with the Ground Observers / Chase Aircraft and / or PDT Tower for the duration of the mission. The UAS operator shall obtain permission from ATC prior to entering/exiting PDT Class D.
8. Point of Contact. The point of contact is CW4 Gregg Schroeder at (503) 584-3472 or email gregg.schroeder@us.army.mil.


TODD E. FARMER
COL, AV

State Army Aviation Officer

2 Encls:

1. Air Worthiness Release
2. PDT COA v3r Map



**UAS COA Request
Shadow UAS
Pendleton, OR**

Communication Systems Description
Attachment

Ground Control Station has instantaneous communication capability utilizing both UHF and VHF radio systems.

GROUND CONTROL STATION FUNCTIONAL DESCRIPTION

The GCS serves as the Shadow 200 UAV System operator interface. It is the central point from which the Air Vehicle Operator (AVO) and Mission Payload Operator (MPO) coordinate all mission and communication functions. The GCS provides near real-time control, near real-time mission progress, video display, and system function monitoring. The GCS provides operator interface through graphical on-screen displays (including point and click buttons and sliders), footswitches, knobs, and joysticks. AV control modes optimize Payload control while the AV maintains a loiter point of interest (stare point). Video is displayed with the ability to mark and record position and target characteristics of interest. Video can be displayed in near real time, or recorded for detailed analysis later. All information can be transferred to outside sources through the Tactical Local Area Network (TACLAN) interface.

GCS COMMUNICATIONS SYSTEM

SINGARS Radios (Long and Short Range) – Two units provided; one unit is shelter mounted. The second unit is mounted in the HMMWV cab.

UHF/VHF Radio – Primary radio for voice communications with commercial or military air traffic controllers in secure and non-secure formats.

EPLRS – Provides secure, jam-resistant, near real-time data network communications support.

Hand Held AN/PRC-148 FM Radio – Short range hand held radio capable of communicating with SINGARS and Air traffic controllers.

SINGARS Data Transmission/Reception. Capabilities to transmit and receive MIL-STD-188-220C data formats from the AVO and MPO stations over the SINGARS radios.

INTERCOM/EXTERNAL COMMUNICATIONS – Voice communication over wire for internal and external GCS personnel. Capabilities also exist to transmit intercom communications over

SINGARS and UHF/VHF equipment.

Digital Secure Voice Terminal (DSVT) Voice communications over secure telephone line.

Wire Line Communication – Data transmission and reception at a slow baud rate for unique communications system



Shadow 200 System Baseline

System

Air Vehicles with
Payloads x 3



TALS



Air Vehicle Transport
& Launcher Trailer

Ground Data
Terminal x 2

Ground Control
Stations x 2

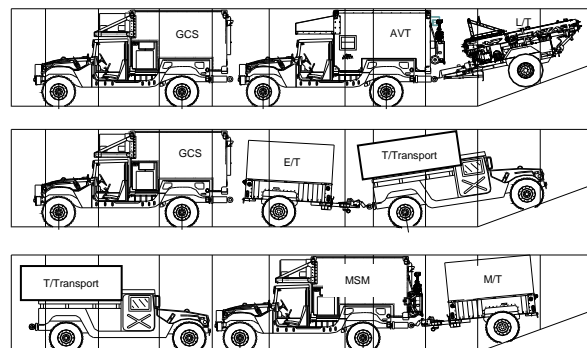


Remote Video
Terminal & Antenna x 4



Portable Ground
Control Station & Data
Terminal

Deployability / Transportability C130 Transportable



Arresting
Net



Equipment
Trailer



Personnel/
Equipment
Transport



Maintenance Section



Air Vehicle



Personnel/
Equipment Transport



Equipment
Trailer



Maintenance
Section
Multifunctional



Personnel
4 x 33W (EW System Repairer)
3 x 52D (Engine Mechanic)

Personnel
1 x 35D (Platoon Leader)
1 x 350U (UAV Warrant Officer)
1 x 96U (Platoon Sergeant)
12 x 96 U (Air Vehicle Operators)

UAS Certificate of Authorization Request
RQ-7B Shadow Unmanned Aerial System (UAS)
Eastern Oregon Regional Airport, Pendleton Oregon

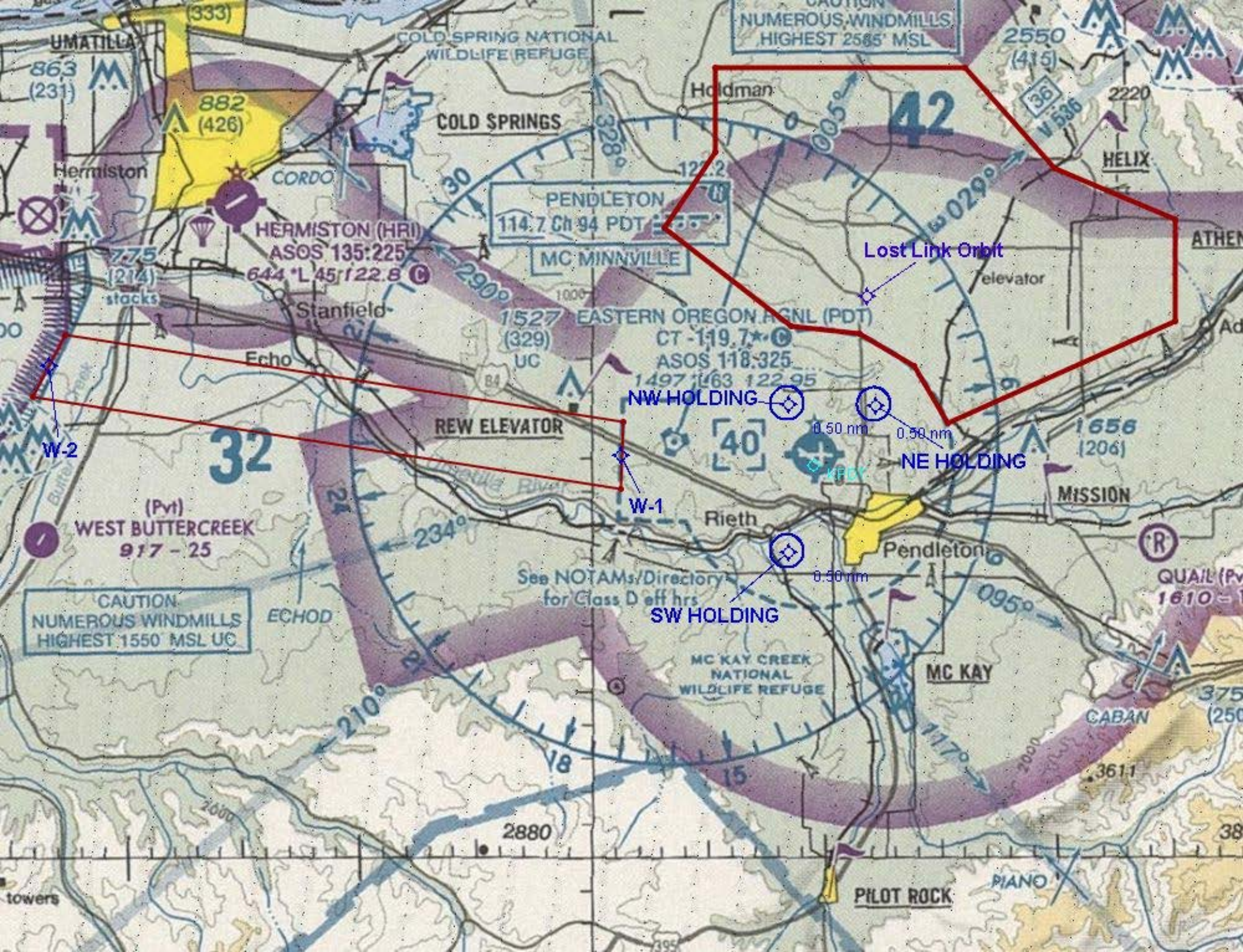
Tracking Capability (Item 15.d)
Attachment

The RQ-7B and Ground Control Station (GCS) or Portable Ground Control Station (PGCS) are equipped with the Enhance Position Location Reporting System (EPLRS). The air vehicle and GCS/PGCS communicate via UHF frequency that provide near real time location identification for vehicle operator.

UAS Certificate of Authorization Request
RQ-7B Shadow Unmanned Aerial System (UAS)
Eastern Oregon Regional Airport, Pendleton Oregon

Emergency Procedures
Attachment

All emergencies that occur on the ground will be handled in accordance with the Det 1,B Company, STB and Pendleton Army Aviation Support Facility (AASF) Pre-Accident Plan. In the event of an in-flight emergency, the Mission Coordinator (MC) or Officer In Charge (OIC) will immediately inform Seattle Center (Chinook Approach), the AASF Commander and the ATC Controller telephonically. The UAS will be flown to the “Home” (Emergency) waypoint and remain until the emergency is terminated either by the OIC, AASF Commander, ATC Controller, or Seattle Center (ATC). Activation of emergency personnel will be determined by ATC or AASF Commander on a case by case basis. In the event of an on-airfield emergency involving manned or UAS, all launch and recovery activity will be halted until the emergency is terminated. Resumption of activities after an emergency must be approved by the AASF Commander or ATC Controller. Manned aircraft emergencies will have precedence over unmanned aircraft.



2012-WSA-105 OPAREAs**Northern OPAREA – Altitude: at or below 4,000 ft MSL (as assigned by Chinook Approach)**

Point 1	N 45°45'52.00"	W 118°51'27.98"
Point 2	N 45°45'38.49"	W 118°48'28.71"
Point 3	N 45°44'40.79"	W 118°46'09.86"
Point 4	N 45°42'58.90"	W 118°44'41.98"
Point 5	N 45°46'03.05"	W 118°34'54.95"
Point 6	N 45°49'05.96"	W 118°34'54.95"
Point 7	N 45°50'38.04"	W 118°40'07.80"
Point 8	N 45°53'38.50"	W 118°43'56.29"
Point 9	N 45°53'38.50"	W 118°54'41.32"
Point 10	N 45°51'07.50"	W 118°54'41.32"
Point 11	N 45°48'50.00"	W 118°56'53.14"

West Transit Area - Altitude: at or below 4,000 ft MSL (as assigned by Chinook Approach)

Point 12	N 45°45'37.35"	W 119°22'40.50"
Point 13	N 45°43'46.01"	W 119°24'05.64"
Point 14	N 45°40'59.00"	W 118°58'45.87"
Point 15	N 45°43'00.46"	W 118°58'40.44"

Lost Link Orbit	N 45°46'46.00"	W 118°48'11.00"
NW Holding - within .5 nm radius of	N 45°43'32.00"	W 118°51'33.00"
NE Holding - within .5 nm radius of	N 45°43'30.00"	W 118°47'49.00"
SW Holding - within .5 nm radius of	N 45°39'05.00"	W 118°51'33.00"
W-1	N 45°41'59.49"	W 118°58'45.57"
W-2	N 45°44'41.63"	W 119°23'23.50"

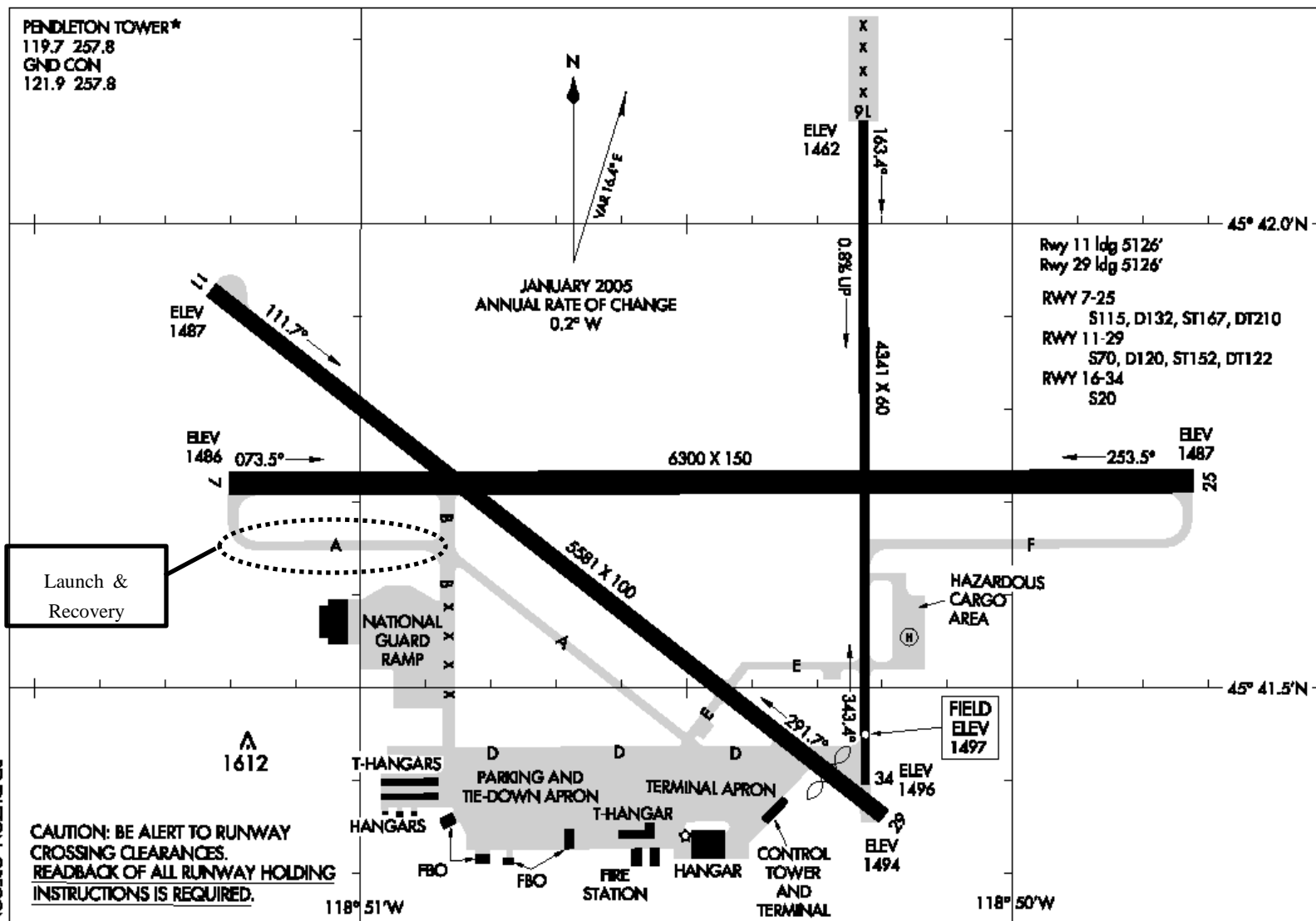
Lost Link Altitude: 3,500 ft MSL

PDT COA Request: Item 18 (Departure and Arrival Location Attachment)

NW-1, 26 OCT 2006 to 23 NOV 2006

AIRPORT DIAGRAM

PENDLETON/EASTERN OREGON REGIONAL AT PENDLETON (PDT)



NW-1, 26 OCT 2006 to 23 NOV 2006

AIRPORT DIAGRAM

PENDLETON/EASTERN OREGON REGIONAL AT PENDLETON (PDT)
AL-316 (FAA)

06215

UAS Certificate of Authorization Request
RQ-7B Shadow Unmanned Aerial System (UAS)
Eastern Oregon Regional Airport, Pendleton Oregon

Launch and Recovery Procedures
Attachment

Controlled by an automatic takeoff and landing system, it is rail catapult launched and uses a tail hook for rolling arrested recoveries, both within an area of 1150' length by 50' width. Emergency landings are by use of a parachute. Recovery and landing is typically performed autonomously by the Tactical Automated Landing System (TALS), a process similar to an Instrument Landing System (ILS) approach for manned aircraft. A UAS operator located in the Ground Control Station (GCS) controls the air vehicle, continually monitoring system status, and maneuvers the air vehicle as desired. The downlink data includes a display of health and status parameters such as attitude, magnetic heading, indicated airspeed, GPS position, barometric altitude, rate of climb, engine instrumentation, and warnings and cautions. Air vehicle position is displayed onto a high-resolution digital map within the GCS. The primary and backup links have an operational range of 109 nautical miles. Both links incorporate error detection to ensure that erroneous interference is not processed by the avionics. Two separate up-link frequency bands and a directional antenna are incorporated to minimize communication link issues due to interference.

**UAS Certificate of Authorization Request
RQ-7B Shadow Unmanned Aerial System (UAS)
Eastern Oregon Regional Airport, Pendleton Oregon**

**Lost Communications
Attachment**

In the event of lost communication with ground control stations, the Mission Coordinator (MC) will immediately inform Eastern Oregon Regional Airport Control Tower, the Army Aviation Support Facility Commander via telephone. He/she will inform them of the UAS flight path and altitude as it returns to the predetermined lost link recovery area. If the data link is lost, the UAS will turn directly to the preprogrammed recovery area; eliminating any exposure to general aviation airspace. The UAS will navigate to and loiter at the recovery area until communications are reestablished or the determination is made to deploy the recovery parachute. The UAS will return to the predetermined lost link waypoint at or above 3,000 feet MSL

UAS Certificate of Authorization Request
RQ-7B Shadow Unmanned Aerial System (UAS)
Eastern Oregon Regional Airport (KPDT)

Lost Link/Mission Consideration
Attachment

The Pendleton Certificate of Authorization flight area consists of three (3) zones. Zone A is that area depicted on Attachment 1 that lies within Class D Airspace and shall be flown from the surface up to 2500 feet AGL as directed by Air Traffic Controllers.

Zone B as that area depicted on Attachment 1 and is outside of Class D Airspace, flown from a minimum altitude of 2,000 feet AGL up to 4,000 feet MSL or as directed by Chinook Approach Control. Flight inside this Zone shall be accompanied by a Chase Aircraft.

Zone C is that portion depicted on attachment 2 and is defined as a flight corridor between Zone A and Restricted Airspace 5701. Minimum flight altitude shall be 2,000 feet AGL up to an altitude assigned by Chinook Approach Control and shall be accompanied by a Chase aircraft. Prior to Air Vehicle Launch, primary and secondary flight control frequencies shall be programmed as prescribed by the Air Vehicle Operator Manual.

Common Mission Considerations. In the event of Lost Link with ground control station irrespective of Zone are: The UAS will loiter at the Lost Link/Rally Home waypoint until primary link is re-established or secondary link established through the employment of a Portable Ground Control Station or Flight termination with the employment of the emergency parachute recovery system. The Mission Coordinator or Senior Ranking Military person shall immediately notify ATC, the Platoon Leader and/or Commander of the Army Aviation Support Facility by two way radio communication or telephone. He/she will provide the UAS flight path and altitude as the air vehicle proceeds to the pre-determined Lost Link/Rally Home waypoint. Minimum altitude for Lost Link/Rally Home recovery is 2,000 feet AGL. Lost Link/Rally Home Waypoints for each Zone considers the best geography for re-establishing link and safety of personnel and equipment on the ground.

ZONE A lost Link/Rally Home waypoint for Zone A is as depicted on Attachment One (1) located at N 45° 46' 46.00" W 118° 48' 11.00". The Air Vehicle shall fly direct to the lost Link/Rally Home waypoint at an altitude of 3,500 MSL and remain until either link is re-established or flight termination. A ground observer shall be positioned at the Lost Link/Rally Waypoint and remain until the Air Vehicle is recovered.

ZONE B Lost Link/Rally Home waypoint is depicted on Attachment One (1) located at N 45° 46' 46.00" W 118° 48' 11.00". Flight into this Zone requires Chase Aircraft with two way radio communication established with Chinook Approach Control.

ZONE C Irrespective of direction of travel, in the event of Lost Link, the Air Vehicle shall return to R-5701 via the corridor to a point geographically centered over the tactical airstrip.

Flight along the corridor requires a Chase Aircraft while outside of Restricted Airspace. Minimum Flight Altitude in the corridor is 2,000 feet AGL which will maintain "Line-of-Sight" requirements as depicted on Attachment(s) Four (4) A and Four (4) B. Without regard of direction of travel,

(except)

When returning to PDT for flight termination, and just prior to reaching W-1 (N 45° 41' 59.49" W 118° 58' 45.57"), the air vehicle shall be re-programmed to the Lost Link/Rally Waypoint located inside of Zone Bravo via direct W-1 direct LLWPT at an altitude of 3,500 MSL. A ground observer shall be positioned at the LLWPT when the flight plan indicates termination at KPDT and prior to reaching W-1. Chase aircraft shall not be required to proceed to and hold at the LLWPT for observation.

ATTACHMENTS:

1. PDT_COA_Operational Area Map.
2. Pend_Board_Radial_LOS_from_Pend_Launch_Recovery



DEPARTMENT OF THE ARMY
US ARMY RESEARCH, DEVELOPMENT AND ENGINEERING COMMAND
AVIATION AND MISSILE RESEARCH, DEVELOPMENT, AND ENGINEERING CENTER
5400 FOWLER RD
REDSTONE ARSENAL, AL 35898-5000

RDMR-AEV

28 Mar 12

AWR RQ-7B20120328

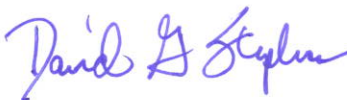
MEMORANDUM FOR Project Manager, Unmanned Aircraft Systems (SFAE-AV-UAS),
Redstone Arsenal, AL 35898-5000

SUBJECT: Airworthiness Release (AWR) for Operation of RQ-7B Shadow Unmanned
Aircraft System (UAS) (AWR RQ-7B20120328) (TN 109093)

1. Scope: This memorandum constitutes an Airworthiness Release Qualification Level 3 authorizing operation of the RQ-7B Shadow Unmanned Aircraft System within the Federal Aviation Administration (FAA) approved Certificate of Authorization (COA) area at Pendleton, OR.
2. Validity: This AWR is new and terminates 28 Mar 14, upon changes in configuration of the subject equipment, or upon issuance of a later AWR, whichever occurs first. This AWR is valid only for operations within the Federal Aviation Administration (FAA) approved Certificate of Authorization (COA) area at Pendleton, OR.
3. Appendices: This memorandum and its appendices shall be carried in the logbook, controlling Ground Control Station (GCS), and aircraft historical record file.

Appendix A - Restrictions and Operating Information
Appendix B - Configuration and Installation Detail
Appendix C - Inspections, Maintenance, and Logbook Instructions
Appendix D - Reference List

4. The points of contact (POC) are Mr. David Hunnicutt, commercial (256) 313-5364, or email: david.hunnicutt@us.army.mil, or Mr. Peter Dobbs, commercial (256) 876-2864, or e-mail: peter.dobbs@us.army.mil.


DAVID B. CRIPPS
Director (Acting)
Aviation Engineering

SUBJECT: Airworthiness Release (AWR) for Operation of RQ-7B Shadow Unmanned Aircraft System (UAS) (AWR RQ-7B20120328) (TN 109093)

Appendix A - Restrictions and Operating Information:

WARNING

The RQ-7B Shadow UAS has not completed full airworthiness qualification. All flight operations shall be conducted in a manner to minimize exposure to manned aircraft and populated ground areas.

WARNING

The RQ-7B Shadow UAS has not undergone Explosive Atmosphere testing. A serious fire or explosion may result if the aircraft is powered while flammable vapors are present during ground or flight operations. The precautions in paragraph 3 of this appendix shall be observed in order to ensure safe operations.

WARNING

The RQ-7B Shadow UAS does not have a sense and avoid system. Mid-air collision is a risk. All flight operations shall be conducted to ensure that minimum separation standards are maintained.

CAUTION

The RQ-7B Shadow UAS Airborne Computing Equipment (ACE) may experience erroneous reboots (warm boots) in flight. Multiple warm boots in flight have resulted in loss of aircraft control. The precautions in paragraph 18 of this appendix shall be observed in order to ensure safe operations.

CAUTION

The RQ-7B Shadow UAS has not been tested for the effects of lightning. Flight operations shall be restricted to no less than 25 nautical miles from lightning activity.

CAUTION

The RQ-7B Shadow UAS has not undergone testing to determine Electromagnetic Interference/Electromagnetic Compatibility (EMI/EMC) or susceptibility to internal or external electromagnetic fields. The aircraft may experience erroneous data reports, and/or loss of control of aircraft, and/or loss of control of laser payload. Operators shall avoid sources of electromagnetic fields such as but not limited to transmitters, power lines, and cell towers.

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NOTE

Accidental operation of the RQ-7B Shadow UAS outside of the FAA approved COA shall be immediately reported to Air Traffic Control (ATC) / Range Control. The operator shall make immediate actions to correct the flight path and/or follow ATC/Range Control direction.

1. The aircraft operating instructions, procedures, and limitations shall be in accordance with the operator's manual, D-1 and D-2, checklist, D-3, interactive electronic technical manual (IETM), D-4, Letters of Agreement (LOAs), D-5 and D-6, and this AWR. In the event of conflict between these documents, the information in this AWR shall prevail.
2. Flight of the RQ-7B Shadow UAS is restricted to Visual Meteorological Conditions (VMC).
3. Due to lack of SOF Explosive Atmosphere testing, the following precautions shall be observed in order to ensure safe flight:
 - a. The aircraft shall be un-powered and grounded IAW the operator's manual, D-1 and D-2, and checklist, D-3, during refueling operations.
 - b. Ground operations of the aircraft shall be conducted at the greatest distance practical (no less than 50 feet) from all other aircraft and fuel depots.
4. Data link frequencies shall be de-conflicted through the local frequency manager/coordinator prior to conducting operations.
5. The Return Home Point shall be inside active restricted airspace, over a suitable ditch point, within range of the omni-antenna.
6. An appropriate Return Home Point shall be set such that the aircraft will not exit the COA corridor in either the horizontal plane or vertical plane during lost link flight.
7. In the event of loss of control, local ATC/Range Control and the chase aircraft/observers shall be notified.
8. In the event of an engine failure or other catastrophic failure, local ATC/Range Control and chase aircraft will be notified immediately and the aircraft shall be ditched over the appropriate Return Home Point in active restricted airspace if possible. If not possible to make the Return Home Point, every effort shall be made to visually inspect the probable impact area with the payload prior to parachute deployment.
9. The flight path of the aircraft shall be within a 4:1 glide ratio of a pre-established ditching point.

SUBJECT: Airworthiness Release (AWR) for Operation of RQ-7B Shadow Unmanned Aircraft System (UAS) (AWR RQ-7B20120328) (TN 109093)

10. Chase aircraft/observer shall maintain uninterrupted visual contact with the RQ-7B aircraft while within the FAA approved corridor. Additionally, the chase aircraft/observer shall maintain continuous radio contact with both ATC and the controlling GCS while the air vehicle is within the corridor. In the event that visual contact with the RQ-7B aircraft is interrupted, the chase aircraft/observer shall immediately notify both ATC and the GCS which shall initiate Return to Base or flight termination procedures.
11. Flight over populated areas is prohibited.
12. The aircraft shall not be flown at altitudes below 2000 feet Above Ground Level (AGL) except for launch and recovery activities.
13. During preflight someone other than the operator shall verify that the Return Home Point is entered correctly.
14. Local ATC/Range Control shall be notified with a flight plan or flight strip prior to departure, to aid in airspace de-confliction.
15. Verified loss of any aircraft flight-critical subsystem or Ground Control Station (GCS) flight-critical subsystem shall require Return To Base (RTB).
16. All flight operations shall be conducted with a minimum of one controlling GCS or PGCS and one back-up GCS or PGCS at each launch/recovery site.
17. Airspace de-confliction outside of the restricted airspace shall be IAW the FAA COA.
18. Simultaneous loss of primary and secondary data link, loss of fuel load indication, unexplained loss of Return Home Point, or Rotor Air Temperature (RAT) indication of "-0" may be indicative of an ACE warm boot. In the event of a warm boot the operator shall initiate RTB, and report the anomaly to maintenance personnel.
19. Any unexplained anomaly shall initiate a return to the Return Home Point, or trouble shooting may be performed within the active restricted airspace
20. Any procedural deficiencies or flight anomalies detected during operations shall be corrected, annotated, and reported to the POC listed in paragraph 4 of this AWR.
21. A minimum of a 10 knot forward ground speed shall be maintained flying into prevailing winds at flight altitude and all lower altitudes. The intent of this 10 knot buffer is to ensure that the air vehicle will be controllable to remain within the confines of restricted airspace at all times to include potential emergency conditions.
22. The aircraft shall maintain capability to climb at a minimum of 100 feet per minute (fpm).

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23. This AWR does not authorize use of the POP 300D Laser Designator.

24. Commander's Corner:

The RQ-7B Shadow Unmanned Aircraft System (UAS) has not completed full airworthiness qualification testing. Strict adherence to the Operators Manual, local flight regulations and this AWR will minimize the hazards of operation. The RQ-7B aircraft may report a flight altitude +/- 200ft of actual altitude; flight altitude should be planned accordingly.

The RQ-7B Shadow UAS currently carries 39 Medium Risks which are identified in the System Safety Risk Assessments (SSRAs), D-7 and D-8.

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Unmanned Aircraft System (UAS) (AWR RQ-7B20120328) (TN 109093)

Appendix B - Configuration and Installation Detail:

Configuration- This aircraft is a production configuration as identified in the operator's manual, D-1 and D-2, and IETM, D-4. Any deviation to production configuration shall be approved in writing by the Aviation Engineering Directorate (POC in cover memorandum paragraph 4) for this AWR to be valid.

SUBJECT: Airworthiness Release (AWR) for Operation of RQ-7B Shadow
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Appendix C - Inspections, Maintenance, and Logbook Instructions:

1. In the event any operating limit, or limits established by this release, is exceeded in addition to the normal entry on DA Form 2408-13, appropriate inspections shall be performed prior to next flight.

2. Aircraft Logbook Entries:

a. In accordance with Department of the Army (DA) Pamphlet X-Draft-C1, Functional Users Manual for the Army Maintenance Management System – Unmanned Aerial Vehicle Systems (TAMMS-UAVS), the following entries shall be made on the DA Form 2408-13-1 and shall be perpetuated on each form until superseded by another AWR, or until reason for limitation is removed.

(1). Place a circled "X" on the form IAW TAMMS-UAVS. In the Fault Information Block, make the following entry: "Operate within limitations and restrictions specified in the enclosed airworthiness release dated 28 Mar 12."

(2). A weight and balance form DD365 shall be maintained on file in each aircraft's log book and weight and balance book maintained by the operational unit.

SUBJECT: Airworthiness Release (AWR) for Operation of RQ-7B Shadow Unmanned Aircraft System (UAS) (AWR RQ-7B20120328) (TN 109093)

Appendix D - Reference List:

1. Technical Manual 1-1550-689-10-1, Operator's Manual for Shadow 200 Tactical Unmanned Aircraft System (TUAS), dated 8 April 2011, with latest updates.
2. Technical Manual 1-1550-689-10-2, Operator's Manual for Shadow 200 Tactical Unmanned Aircraft System (TUAS), dated 8 April 2011, with latest updates.
3. Technical Manual 1-1550-689-CL, Operator's and Crewmember's Checklist for Shadow 200 Tactical Unmanned Aircraft Systems (TUAS), dated 03 May 2010, with latest updates.
4. Technical Manual 9-1550-689-23&P, Interactive Electronic Technical Manual (IETM) Field Maintenance Manual for the Shadow 200 Tactical Unmanned Aircraft Systems (TUAS), dated 03 May 2010, with latest updates.
5. Letter of Agreement Between Eastern Oregon Regional Airport Control Tower and Army Aviation Support Facility #2 and DET 1, Company B, Special Troops Battalion, 41st, IBCT.
6. Letter of Agreement to Establish Procedures for the Pendleton Tactical Unmanned Aerial Vehicle (Shadow).
7. System Safety Risk Assessment, Document No. RQ-7-07-NFSP-01.
8. System Safety Risk Assessment, Document No. UAS-09-NFSP-02.

TABLE F-2 Shadow 200 Tactical Unmanned Aircraft System
1 November 2007

SYSTEM AND PART NUMBER

LEGEND: A = MODEL USED ON FORM 2408-16 B = TYPE COMPONENT/ITEM C = DA FORM 2408-5-1 D = SEPARATE DA
E = NEXT HIGER COMPONENT DA FORM 2408-16 F = AV TIME CHANGE DA FORM 2408-16
G = AV CONDITION CHANGE DA FORM 2408-16 H = DA FORM 2410

RQ-7B SHADOW TUAV SYSTEM

Nomenclature	NSN	WUCD	A	B	C	D	E	F	G	H	REMARKS
1100 Engine		RQ-7B	B	TC	X	X		X		X	QCA
1101 Engine		RQ-7B	B	TC	X	X		X		X	QCA
Alternator		RQ-7B	B	CC	X		X			X	QCA (Eng Sub assy.)
Electronic Ignition Module/1101 engine		RQ-7B	B	CC	X		X			X	LRU (Eng Sub assy.)
Voltage Regulator/1100 Engine		RQ-7B	B	CC	X	X			X	X	LRU
Voltage Regulator/1101 Engine		RQ-7B	B	CC	X	X			X	X	LRU
ACE II Box		RQ-7B	B	CC	X	X			X	X	LRU
Magnetometer		RQ-7B	B	CC	X	X			X	X	LRU

Servo actuator – rotary		RQ-7B	B	CC	X	X			X	X	LRU
Servo actuator – flap		RQ-7B	B	CC	X	X			X	X	LRU
POP 200 payload		RQ-7B	B	CC	X	X			X	X	LRU
POP 300 payload		RQ-7B	B	CC	X	X			X	X	LRU
TALS TCU		RQ-7B	B	CC	X	X			X	X	LRU
TALS RADOME		RQ-7B	B	CC	X	X			X	X	LRU
AV TALS AS		RQ-7B	B	CC	X	X			X	X	LRU
VME-HD CHASSIS		RQ-7B	B	CC	X	X			X	X	LRU
DIB (Data Link Interface Box)		RQ-7B	B	CC	X	X			X	X	LRU

UAS Certificate of Authorization Request
RQ-7B Shadow Unmanned Aerial System (UAS)
Eastern Oregon Regional Airport, Pendleton Oregon

Visual Surveillance/Detection Capability
Attachment

Traffic avoidance will be accomplished by maintaining positive two way radio communication with Pendleton Tower Controller or Chinook Approach control by letter of agreement and assigning ground visual observers spaced within 2 – 3 kilometers of the UAS laterally and not greater than 3,000 feet AGL vertically.